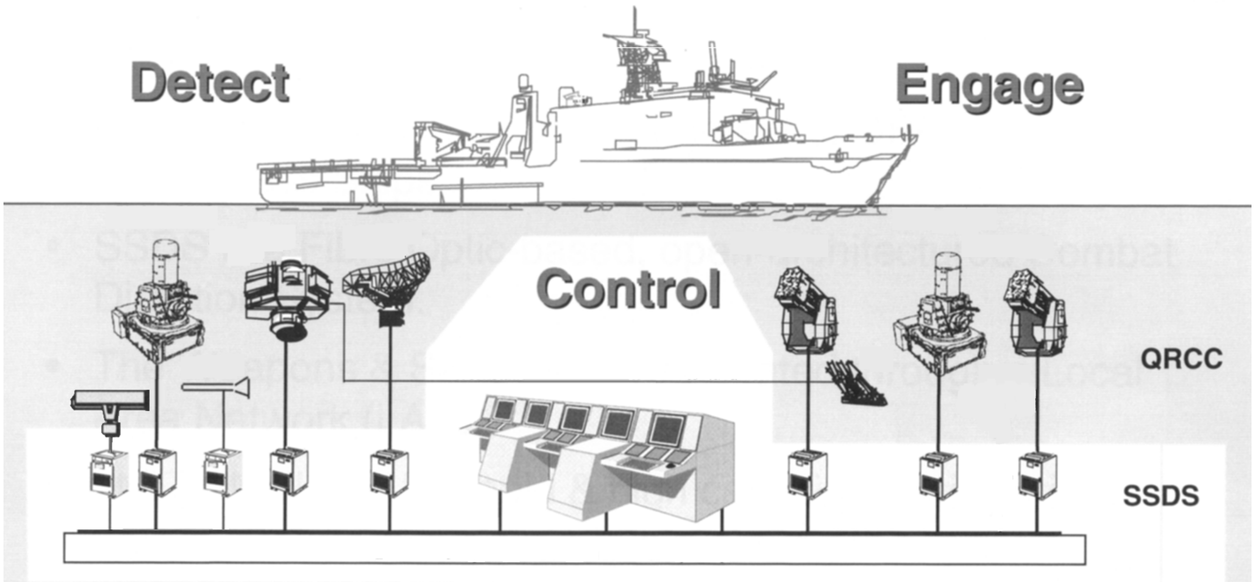
SHIP SELF DEFENSE SYSTEM (SSDS)



Navy ACAT II Program

Total Number of Systems:	58
Total Program Cost (TY$):	$823.2M
Average Unit Cost (TY$):	$10.0M
Full-rate production:	FY98

Prime Contractor

Raytheon Systems Company
Naval and Maritime Systems
San Diego, CA

SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2010

The principal air threat to U.S. naval surface ships is a variety of highly capable anti-ship cruise missiles (ASCMs). These include subsonic (Mach 0.9) and supersonic (Mach 2+), low altitude ASCMs. Detection, tracking, assessment, and engagement decisions must be accomplished to defend against these threats, with the duration from initial detection of an ASCM to its engagement with weapons typically on the order of a minute or less. SSDS is designed to accomplish these defensive actions.

With radars and anti-air weapons for self defense of today's amphibious ships and aircraft carriers installed as stand-alone systems, considerable manual intervention is required to complete the detect to engage sequence against ASCMs. The Ship Self Defense System (SSDS) is designed to expedite that process. SSDS, consisting of software and commercial off-the-shelf hardware, integrates radar systems with anti-air weapons, both *hardkill* (missile systems and rapid fire gun systems (Mk 1 only)) and *softkill* (decoys). SSDS includes embedded doctrine to provide an integrated detect-through-engage capability with options ranging from use as a tactical decision aid (up to the point of recommending when to engage with specific systems) to use as an automatic weapon system to respond with hardkill and softkill systems (as targets become engageable.) Although SSDS will not improve capability of individual sensors, it enhances target tracking by integrating the inputs from several different sensors to form a composite track. For example, SSDS will correlate target detections from individual radars, the Electronic Support System (Radar Warning Receiver), and the Identification-Friend-or Foe system, combining these to build composite tracks on targets while identifying and prioritizing threats. Similarly, SSDS will not improve capability of individual weapons, but should expedite the assignment of weapons for threat engagement, and provide a "recommend engage" display for operators, or if in automatic mode, initiate weapons firing, Electronic Attack transmission, chaff or decoy deployment, or some combination of these.

SSDS Mark 1 provides the functionality described above, with integration of the sensor and engagement suites for the combat system on the LSD 41-class amphibious ships. SSDS Mark 2 is intended to provide the described functionality for different sensor and engagement suites on aircraft carriers and LPD 17 amphibious warfare ships. In addition, Mark 2 will incorporate the functionality of the Advanced Combat Direction System Block 1, using different software code. Mark 2 will also include an interface with the Cooperative Engagement Capability.

SSDS integrates previously “stand-alone” sensor and engagement systems for aircraft carriers and amphibious warfare ships, thereby supporting the ***Joint Vision 2010*** concept of ***full-dimensional protection*** by providing a final layer of self-protection against air threat “leakers” for individual ships. By ensuring such protection, SSDS contributes indirectly to the operational concept of ***precision engagement***, in that strike operations against targets are executed from several of the platforms receiving SSDS.

BACKGROUND INFORMATION

A successful at-sea demonstration was conducted with an amphibious ship (LSD-41) in June 1993 as a proof-of-concept exercise, at the direction of Congress. Milestone II was conducted in May 1995. Total procurement consists of 58 units, with 48 slated for amphibious ships and aircraft carriers and ten supporting training and engineering development. LRIP consisted of four units. The LRIP decision in late FY96 was supported by an OA conducted by COMOPTEVFOR. OPEVAL of SSDS Mark 1 was conducted during June 1997, in accordance with a DOT&E-approved plan and TEMP, to support the B-LRIP decision for procurement of SSDS. Based on OPEVAL results, SSDS is operationally effective against sub-sonic, low altitude ASCMs. This conclusion alone marks a major improvement in the self-defense capability of amphibious warfare ships against air threats. SSDS is operationally suitable. The Navy acquisition decision authority granted approval for full production in March 1998. Planning is underway for an upgrade of SSDS to the Mark 2 configuration.

TEST & EVALUATION ACTIVITY

Mark 1. FOT&E was conducted onboard the remotely controlled Self Defense Test Ship during FY1999. FOT&E was conducted concurrently with OPEVAL of the Rolling Airframe Missile (RAM) Block 1 system and the Phalanx Close-In Weapon System (CIWS) Block 1B at the Naval Air Warfare Center, Weapons Division sea range at Point Mugu, CA. Use of the Self Defense Test Ship permitted threat-representative profiles by ASCMs and surrogates for realistic testing of SSDS without the safety concerns associated with use of a manned ship. The combat system installation on the SDTS emulated that of the LSD 41-class of landing dock ships, with the exceptions that the installation included one vice two RAM launchers and one vice two CIWS; CIWS Block 1B (with added capability of electro-optical tracking) was used vice a Block 1A (no electro-optical tracker); and the installation included neither an AN/SPS-67 surface search radar nor a combined identification friend-or-foe (CIFF) system. A separate phase for examining operational suitability issues will be conducted in FY00. Testing will be conducted in accordance with a DOT&E-approved test plan and TEMP, and will be observed by the Director’s staff.

Testing was delayed, first by a leak in the 43 year-old hull of the SDTS and, later as a result of a target hitting the SDTS during an SSDS FOT&E scenario. This ship, which is controlled remotely and is unmanned during testing, is required in order to present threat-representative attack profiles by the targets for adequate testing of SSDS when firing RAM (or any other short range air defense system). Safety precludes use of a fleet ship for this testing due to the attendant danger of impact by a target or target debris.

Mark 2. Activity consisted of definition of the overall T&E program, including definition of measures of effectiveness and suitability.

TEST & EVALUATION ASSESSMENT

Mark 1. By virtue of the more operationally realistic environment for this FOT&E, which was achieved by use of the Self Defense Test Ship, several problems that were not observed during the OPEVAL were observed and corrected. Additionally, at the combat system level, problems were observed both with the sensor suite and the engagement suite that SSDS integrates and coordinates. SSDS, in its coordination and integration of the sensor and engagement suites of the LSD 41-class ship, is assessed to be operationally effective against most current ASCM raids. Assessment of operational suitability has not been completed, but will be conducted in FY00.

Mark 2. The program includes a land-based test phase at Wallops Island, VA, and at sea phases on two aircraft carriers and an LPD 17-class ship. While these appear to provide adequate testing of most mission areas, the mission of ship self defense against anti-ship cruise missiles is an exception. For this reason, an additional phase of testing is being added. This will require anti-ship cruise missiles or acceptable surrogates as targets. In addition to providing an adequately realistic environment to demonstrate overall combat system capability, results of these tests will be used to validate Modeling and Simulation to predict the probability of raid annihilation, which is a ship air defense requirement, where a raid is an attack by anti-ship cruise missiles. Since the existing SDTS may not be able to support installation of an AN/SPS-48E radar, which is a primary sensor of the LPD-17 combat system, a follow-on test ship, capable of being remotely operated during operationally realistic ship air defense scenarios, may be required for this testing.